

### *11.1. Strandings*

Most of the strandings occurred on 12 and 13 May 1996. The strandings coincided in time and location with the SWAC research runs 9 and 10 (12 May) and with run 13 and 14 (13 May), as well as with earthquakes that occurred on 12 May, 1996.

### *11.2. Presence of Odontocetes*

During the SWAC research run 9 on 12 May 1996 there was - after 5 min - a positive detection of sperm whales at distances of 3 km or greater from the acoustic source. Signals from other odontocetes were also detected at indeterminate distances. The recording system did not function correctly for 5 min directly after the start of the run. Consequently, the presence of odontocetes at distances less than 3 km at the moment the SWAC research started cannot be excluded. It was not possible to acoustically determine the presence or absence of ziphiids in the area because of insufficient information about the sound production characteristics of this group. During other runs odontocetes were heard at large distances.

### *11.3. Influence of SWAC Sound*

No apparent short-term changes were observed in the behaviour of sperm whales beyond a 3 km radius of the SWAC source based on acoustic records available.

### *11.4. Causes for the strandings*

The Bioacoustic Panel of National Experts has provided its expert opinion on the connection, if any, between the NATO Shallow Water Acoustic Classification (SWAC) research in the Kyparissiakos Gulf in May 1996, and the strandings of Cuvier's beaked whales that occurred in the same general time and area, and to provide advice as to the event. Their opinion is summarized in Section 1.

## References

---

- Arnold, R T., Bass, H E. & Atchley A A. (1984). Underwater sound from strikes to water in the Gulf of Mexico. *Journal of the Acoustical Society of America*, **76**, 320-322.
- ARPA (1995). Final environmental impact statement / environmental impact report for the Californian Acoustic Thermometry of Ocean Climate Project and Associated Marine Mammal Research Programme.
- Carder, D.A., Kamolnick, T.L., Schlundt, C.E., Elsberry, W.R., Smith, R.R. and Ridgway, A.H. (1998) Temporary threshold shift in underwater hearing of dolphins, Proceedings Biological Sonar Conference, Carvoeiro, Portugal, June 1998
- Frantzis, R (1998). Does acoustic testing strand whales, *Nature*, **392**, 1998 March 5, p 29.
- Goold J.C., Jones S.E. (1995). Time and frequency domain characteristics of sperm whale clicks. *Journal of the Acoustical Society of America*, **98**:1279-1291.
- Hill, R.D. (1985). Investigation of lightning strikes to water surfaces. *Journal of the Acoustical Society of America*, **78**:2096-2099.
- Hydrographic Office (1998). Additional Information to Accompany Mediterranean EBD, Miscellaneous Request 4/98, May 1998. UK Hydrographic Office Report (Unpublished Manuscript)
- Hydrographic Office (1988). Mediterranean Pilot, Vol III, 10th Edition, Naval Publication NP47.
- Johnson, C.S. (1968). Relation between absolute threshold and duration-of-tone pulses in bottlenosed porpoise. *Journal of the Acoustical Society of America*, **43**, pp 757,
- Ketten, D.R. (1992). The cetacean ear: form, frequency, and evolution, In: Marine Mammal Sensory Systems, Plenum Press, New York, USA,
- Ketten, D.R. (1998). Marine mammal ears: an anatomical perspective on underwater hearing.. *Journal of the Acoustical Society of America*, **103**, 2938:3pPL1.
- Malanotte-Rizzoli, P., Bergamasco, A. (1991). A wind and thermally driven circulation of the Eastern Mediterranean Sea. Part II: the baroclinic case. *Dynamics of Atmospheres and Oceans* **15**, 355-419.
- Notarbartolo di Sciarra G., Demma M. (1994). Guida dei mammiferi marini del Mediterraneo. Franco Muzzio Ed., Padova: 1-262.
- Pavan G. and Borsani J.F. (1997). Bioacoustic research on cetaceans in the Mediterranean Sea. *Mar. Fresh. Behav. Physiol.*, **30**, 99-123.
- Pavan G., Hayward T., Borsani J.F., Priano M., Manghi M., Fossati C. (1998). Time pattern of sperm whale codas recorded in the Mediterranean Sea 1985-1996. *Journal of the Acoustical Society of America*, **103**, 2957:4aAB5.
- POEM Group. (1992). General circulation of the Eastern Mediterranean. *Earth-Science Reviews*, **32**, 285-309.
- Priano M., Pavan G., Manghi M., and Fossati C. (1997). The Cetacean Sound Library of the Interdisciplinary Centre for Bioacoustics and Environmental Research of the University of Pavia. Proceedings Underwater Bio-Sonar and Bioacoustics Symposium. Proceedings of the Institute of Acoustics, **19** (part 9), Loughborough, UK, 245-249.
- Richardson, W.J., Greene jr, C.R., Malme, C.I. and Thomson, D.H. (1995). Marine Mammals and Noise. Academic Press, San Diego, CA, U.S.A.

Theocharis, A., Georgopoulos, D., Lascartos, A. & Nittis, K. (1993) Water masses and circulation in the central region of the Eastern Mediterranean: Eastern Ionian, South Aegean and Northwest Levantine, 1986-1987. *Deep Sea Research II* **40(6)**, 1121-1142.

Tsimplis, M N. (1994) Tidal oscillations in the Aegean and Ionian Seas. *Estuarine, Coastal and Shelf Science* **39**, 201-208.

Watkins W.A., Fristrup K.M., Daher M.A., and Howald T. (1992). *SOUND* Database of Marine Animal Vocalizations; Structure and Operations, Technical Report WHOI-92-31, Woods Hole Oceanographic Institution, Woods Hole, Massachusetts, USA.

Watkins W.A., Tyack P., Moore K.E., Notarbartolo di Sciara G. (1987). *Steno bredanensis* in the Mediterranean Sea. *Marine Mammal Science*, **3** (1): 78-82.

Whitehead H., Weilgart L. (1989). Click rates from sperm whales. *Journal of the Acoustical Society America*, **87**: 1798-1806.